CLAIMS

1. A method of rendering a left rear surround input signal at a left rear virtual speaker location and rendering a right rear surround input signal at a right rear virtual speaker location comprising:

phase shifting the left rear surround input signal by a first phase shift;

phase shifting the right rear surround input signal by a second phase shift;

transforming the phase shifted left rear surround input signal using an HRTF selected to render the left rear surround input signal at the left rear virtual speaker location; and

transforming the phase shifted right rear surround input signal using an HRTF selected to render the right rear surround input signal at the right rear virtual speaker location.

2. A method of rendering a left rear surround input signal at a left rear virtual speaker location and rendering a right rear surround input signal at a right rear virtual speaker location as recited in claim 1 wherein the left rear surround input signal and the right rear surround input signal are substantially the same signal.

3. A method of rendering a left rear surround input signal at a left rear virtual speaker location and rendering a right rear surround input signal at a right rear virtual speaker location as recited in claim 1 wherein phase shifting the left rear surround input signal by a first phase shift is accomplished by passing the left rear surround input signal through a first allpass filter and wherein phase shifting the right rear surround input signal is accomplished by passing the right rear surround input signal through a second allpass filter.

4. A method of rendering a left rear surround input signal at a left rear virtual speaker location and rendering a right rear surround input signal at a right rear virtual speaker location as recited in claim 3 wherein the first allpass filter and the second allpass filter are each implemented using a delay line and a feedback loop.

5. A method of rendering a left rear surround input signal at a left rear virtual speaker location and rendering a right rear surround input signal at a right rear virtual speaker location as recited in claim 1 wherein the left rear surround input signal and the right rear surround input signal are output from a Pro Logic system.

6. A method of rendering a left rear surround input signal at a left rear virtual speaker location and rendering a right rear surround input signal at a right rear virtual speaker location as recited in claim 1 wherein the left rear surround input signal and the right rear surround input signal are output from an AC-3 system.

7. A method of rendering a left rear surround input signal at a left rear virtual speaker location and rendering a right rear surround input signal at a right rear virtual speaker location as recited in claim 1 wherein the second phase shift is complementary to the first phase shift.

8. A method of rendering a left rear surround input signal at a left rear virtual speaker location and rendering a right rear surround input signal at a right rear virtual speaker location as recited in claim 1 further including:

determining the extent that the left rear surround input signal and the right rear surround input signal are the same and adjusting the magnitude of the first phase shift and the second phase shift according to the extent that the left rear surround input signal and the right rear surround input signal are the same.

9. A method of rendering a left rear surround input signal at a left rear virtual speaker location and rendering a right rear surround input signal at a right rear virtual speaker location as recited in claim 8 wherein:

phase shifting the left rear surround input signal by a first phase shift is accomplished by passing the left rear surround input signal through a first allpass filter implemented using a first delay line and a first feedback loop having a first gain and wherein phase shifting the right rear surround input signal is accomplished by passing the right rear surround input signal through a second allpass filter implemented using a second delay line and a second feedback loop having a second gain;

adjusting the magnitude of the first phase shift is accomplished by adjusting the first gain; and

adjusting the magnitude of the second phase shift is accomplished by adjusting the second gain.

10. A method of decorrelating a first input signal and a second input signal comprising:

phase shifting the first input signal by a first phase shift; and

phase shifting second input signal by a second phase shift;

whereby the first input signal and the second input signal are decorrelated in a manner that does not distort either the first input signal or the second input signal in the perception of a listener when one of the input signals is heard without being combined with the other input signal.

11. A method of decorrelating a first input signal and a second input signal as recited in claim 10, wherein phase shifting the first input signal by a first phase shift is accomplished by passing the first input signal through a first allpass filter and wherein phase shifting the second input signal is accomplished by passing the second input signal through a second allpass filter.

12. A method of decorrelating a first input signal and a second input signal as recited in claim 11 wherein the first allpass filter and the second allpass filter are each implemented using a delay line and a feedback loop.

13. A method of decorrelating a first input signal and a second input signal as recited in claim 10, wherein the second phase shift is complementary to the first phase shift.

14. A method of decorrelating a first input signal and a second input signal as recited in claim 10 further including:

determining the extent that the first input signal and the second input signal are the same; and

setting the magnitude of the first phase shift and the magnitude of the second phase shift according to the extent that the first input signal and the second input signal are the same.

15. A method of decorrelating a first input signal and a second input signal as recited in claim 14 wherein:

phase shifting the first input signal by a first phase shift is accomplished by passing the first input signal through a first allpass filter implemented using a first delay line and a first feedback loop having a first gain and wherein phase shifting the second input signal is accomplished by passing the second input signal through a second allpass filter implemented using a second delay line and a second feedback loop having a second gain;

adjusting the magnitude of the first phase shift is accomplished by adjusting the first gain; and

adjusting the magnitude of the second phase shift is accomplished by adjusting the second gain.

16. A method of converting a mono input signal to a pair of stereo input signals comprising:

filtering the mono input signal using a band pass filter, the band pass filter substantially passing frequencies in a vocal range of frequencies and substantially blocking frequencies outside of the vocal range of frequencies to produce a band pass filter output signal;

filtering the mono input signal using a high pass filter, the high pass filter substantially passing frequencies above a vocal range of frequencies and substantially blocking frequencies within the vocal range of frequencies and frequencies below the vocal range of frequencies to produce a high pass filter output signal;

filtering the mono input signal using a low pass filter, the low pass filter substantially passing frequencies below a vocal range of frequencies and substantially blocking frequencies within the vocal range of frequencies and frequencies above the vocal range of frequencies to produce a low pass filter output signal;

decorrelating the low pass filter output signal and the high pass filter output signal to produce at least a pair of decorrelated signals; and

combining each of the decorrelated signals with the band pass filter output signal to produce a stereo output signal that includes decorrelated signals above and below the vocal range of frequencies.

17. A method of converting a mono input signal to a pair of stereo input signals as recited in claim 16 wherein the low pass filter output signal and the high pass filter output signal are combined before the low pass filter output signal and the high pass filter output signal are decorrelated.

18. A method of converting a mono input signal to a pair of stereo input signals as recited in claim 16 wherein the vocal range of frequencies extends from approximately 300 Hz to approximately 3 kHz.

19. A dynamic decorrelator for decorrelating a first input signal and a second input signal comprising:

a first allpass filter configured to phase shift the first input signal by a first phase shift;

a second allpass filter configured to phase shift the second input signal by a second phase shift; and

a mono detection circuit configured to detect the similarity of the first input signal and the second input signal and to adjust the first phase shift and the second phase shift according to the similarity of the first input signal and the second input signal.

20. A dynamic decorrelator for decorrelating a left rear surround input signal and a right rear surround input signal as recited in claim 19 wherein the first phase shift and the second phase shift are increased as the similarity of the left rear surround input signal and the right rear surround input signal increases.

21. A dynamic decorrelator for decorrelating a left rear surround input signal and a right rear surround input signal as recited in claim 19 wherein the second phase shift is complementary to the first phase shift.

22. A dynamic decorrelator for decorrelating a left rear surround input signal and a right rear surround input signal as recited in claim 19 wherein the first input signal is a left rear surround signal and wherein the second input signal is a right rear surround signal.